

Toward building first home-brew dish

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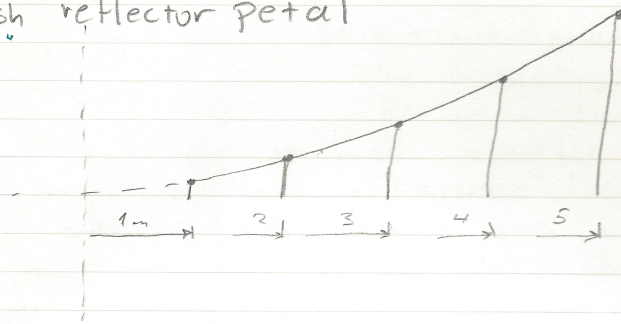
ORNL

11 Feb 2016

- Design now at very practical stage
 - See my notebook drawings
 - No precision machining
 - Some (easy) 3-D printing
- Recommend starting with modular approach, build in units of 10 or 20 degree, single or double petal:
 - Adds some weight in struts, but still dominated by reflector sheet
 - Easier to transport and handle
 - Gain experience with assembly basics before going to full array
- Can throw together single module as a trial easily
 - Need local rep for space, purchasing, other administrative details
 - High-bay in B510 perfect space, if available
- Possibly buy parts pre-machined
 - John H. has contacts

Feb 10, 2016

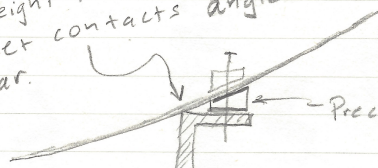
Detailed assembly for dish reflector petal



Curve of a single petal is a parabola, very slightly shallower than rib of ideal paraboloid.

We imagine five support points, spaced every ~1m in radial extent.

Height is fixed where sheet contacts angle strut cross-bar.

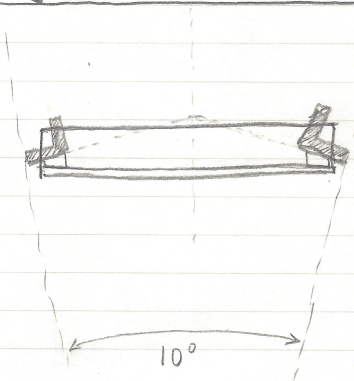


Precision beveled washer, 3-D printed

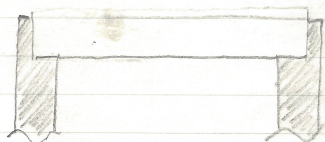
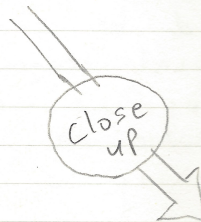
Al angle bar, maybe $1" \times 1" \times \frac{1}{4}"$

How are cross-bar pieces supported? Each rests directly on load-bearing vertical beams, each also made of Al angle strut

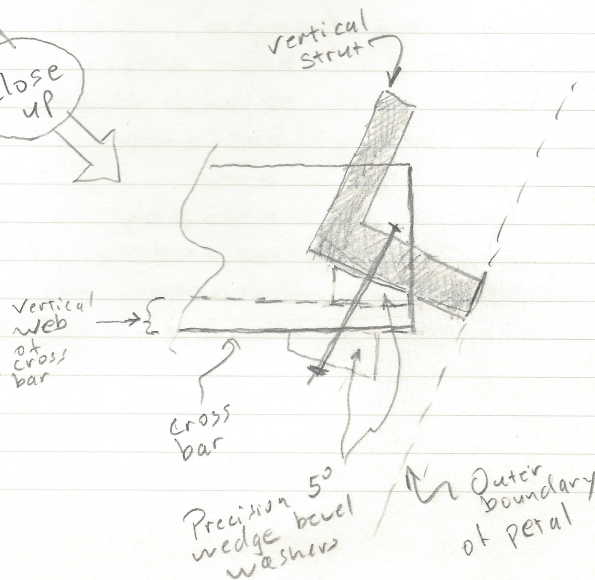
Single petal option



Top/Plan view shows cross-bar (open) angle strut resting atop vertical angle struts (shaded), spacing is held by 3-D printed beveled washer with 5° wedge



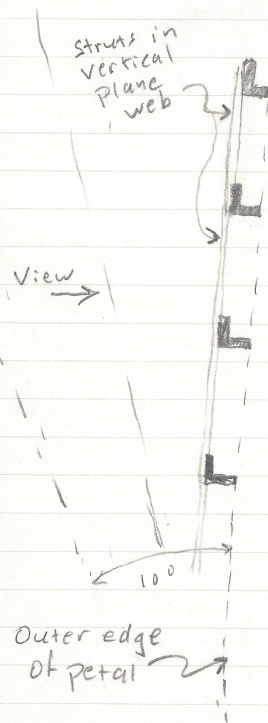
Front view



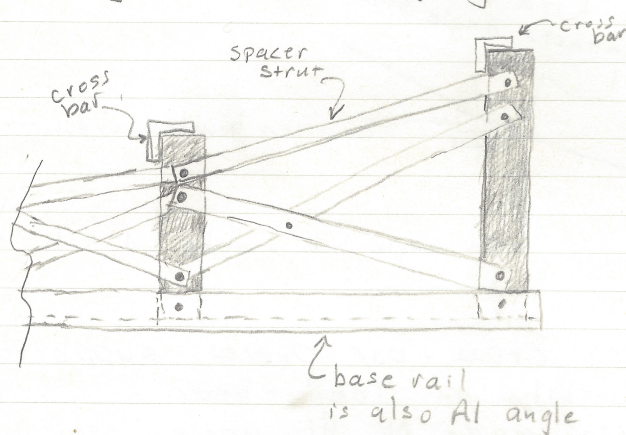
Precision 5° wedge bevel washers

Outer boundary of petal

Now, we need some truss' to hold the vertical struts in place



Here we show four of the five vertical struts in the top view along one outer edge of the petal. The struts that make up the web of the truss run in the vertical plane along the inside edge of the uprights.



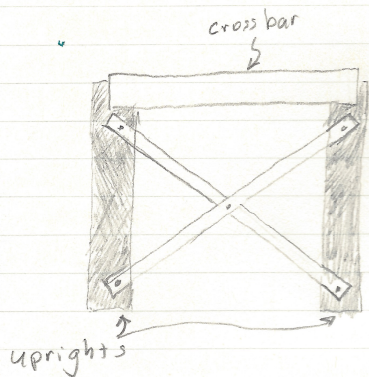
Side view of truss looking from inside

Each successive pair of uprights has a spacer strut running along the top and an "X" in the box for strength.

These struts are all tension members and so can be very light, maybe $1/2" \times 1/16"$ bar

The base rail should be angle strut material like the uprights; total length 4m ~ 13 feet. Not sure how strong we need to make it, that will depend somewhat on what arrangement we make for attaching to the ground.

The truss assembly is very simple, all straight thru-holes. Exact detail/finishing on the struts is unimportant, the only precision work is the spacing between the holes.

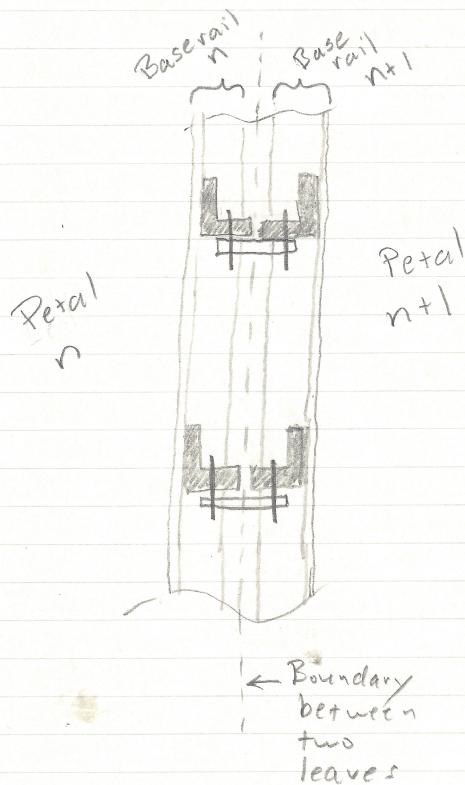


We will also need bracing across the box supporting the petal, between two or more pairs of uprights. These again can be thin tension members

← Front view, looking at a pair of uprights from inner radius to outer



← Top view shows that cross-box struts meet uprights across 5° tapered washers, to keep struts in purely vertical plane, very similar to front plane of crossbar (not shown in this view).



We can join neighboring petal assemblies easily with gusset plates across matching neighbor uprights.

These are also very simple thru holes.

This should permit modular construction of petals one at a time, easily transported and re-assembled, or extended if desired.